



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Reissue Application/Reexamination of: URANO et al.

US Patent No.: 5,216,135

Reexam No.: 90/004,812

8101650

Group Art Unit: 1626

Filed: October 23, 1997

Examiner: STOCKTON, LAURA LYNNÉ

P.T.O. Confirmation No.: 8528

For: DIAZODISULFONES

**MERGED REISSUE & REEXAMINATION PROCEEDING  
PRELIMINARY MENDMENT**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

August 4, 2004

Sir:

In response to the Office Action dated **June 4, 2004**, and with the RCE filed herewith,  
please amend the above-identified application as follows:

06/25/2004 SHARON 00000002 012340 09810650

01 FC:1201 86.00 RA  
02 FC:1202 90.00 DA

U.S. Patent Reexam No. 90/004,812  
U.S. Patent: 5,216,135  
Reply to OA of June 4, 2004

**AMENDMENTS TO THE CLAIMS:**

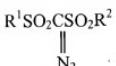
This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

**Claims 1-6 (Canceled).**

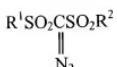
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**Claim 7 (Previously Presented):** A diazodisulfone compound of the formula:



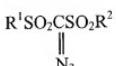
wherein R<sup>1</sup> is a branched alkyl group having 3 to 8 carbon atoms; and R<sup>2</sup> is a cyclic alkyl group having 3 to 8 carbon atoms.

**Claim 8 (Previously Presented):** A diazodisulfone compound of the formula;



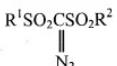
wherein R<sup>1</sup> is a cyclic alkyl group in which the alkyl group is hexyl; and R<sup>2</sup> is a cyclic alkyl group in which the alkyl group is hexyl.

**Claim 9 (Previously Presented):** A diazodisulfone compound of the formula;



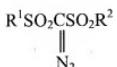
wherein R<sup>1</sup> is a branched alkyl group in which the alkyl group is butyl; and R<sup>2</sup> is a branched alkyl group in which the alkyl group is butyl.

**Claim 10 (Previously Presented):** A diazodisulfone compound of the formula:



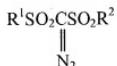
wherein R<sup>1</sup> is cyclohexyl; and R<sup>2</sup> is cyclohexyl.

**Claim 11 (Previously Presented):** A diazodisulfone compound of the formula:



wherein R<sup>1</sup> is a branched butyl; and R<sup>2</sup> is a branched butyl.

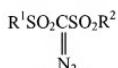
**Claim 12 (New):** A reduced light exposure energy photosensitive resist material containing a diazodisulfone compound of formula (I):



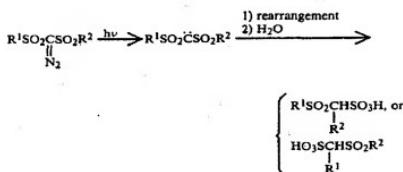
wherein R<sup>1</sup> and R<sup>2</sup> are independently branched or cyclic alkyl groups having 3 to 8 carbon atoms and the photoresist material is used for a light source of 300 nm or less at a reduced light exposure energy amount to generate an acid to create a positive tone pattern on a surface.

**Claim 13 (New):** The photosensitive resist material of claim 12, wherein the light sources is selected from the group consisting of deep UV light and KrF excimer laser light (248.4 nm).

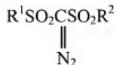
**Claim 14 (New):** A reduced light exposure energy photosensitive resist material containing a diazodisulfone compound of formula (I):



wherein R<sup>1</sup> and R<sup>2</sup> are independently branched or cyclic alkyl groups having 3 to 8 carbon atoms and the compound of formula (I), when exposed to KrF eximer light, generates an acid by the following reaction scheme:



**Claim 15 (New):** A method of using a diazodisulfone compound of the formula:



wherein R<sup>1</sup> is a branched or cyclic alkyl group having 3 to 8 carbon atoms, and R<sup>2</sup> is a straight-chain, branched or cyclic alkyl group having 1 to 8 carbon atoms, said method comprising:  
using said diazodisulfone with a light source of 300 nm or less at a reduced light exposure energy amount to generate an acid to create a positive tone pattern on a surface.

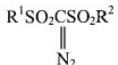
*Amended*  
**Claim 16 (New):** The method of using the diazodisulfone compound according to claim 15, wherein R<sup>1</sup> is a cyclopentyl group, a cyclohexyl group, an isopropyl group, a sec-butyl group, a tert-butyl group or an isoamyl group; and R<sup>2</sup> is a methyl group, an ethyl group, a cyclopentyl group, a cyclohexyl group, an isopropyl group, a sec-butyl group, a tert-butyl group or an isoamyl group.

**Claim 17 (New):** The method of using the diazodisulfone compound according to claim 15, which is  
bis(cyclohexylsulfonyl)diazomethane,  
cyclohexylsulfonylethylsulfonyldiazomethane,  
bis(isopropylsulfonyl)diazomethane,  
bis(tert-butylsulfonyl)diazomethane,  
bis(sec-butylsulfonyl)diazomethane,  
tert-butylsulfonylmethylsulfonyldiazomethane,  
tert-butylsulfonylcyclohexylsulfonyldiazomethane,  
bis(cyclopentylsulfonyl)diazomethane,  
cyclopentylsulfonyl-tert-butylsulfonyldiazomethane, or

U.S. Patent Reexam No. 90/004,812  
U.S. Patent: 5,216,135  
Reply to OA of June 4, 2004

bis(isoamylsulfonyl)diazomethane.

**Claim 18 (New):** A method of using a diazodisulfone compound of the formula:



wherein R<sup>1</sup> is a branched or cyclic alkyl group having 3 to 8 carbon atoms; and R<sup>2</sup> is a branched or cyclic alkyl group having 3 to 8 carbon atoms, said method comprising:

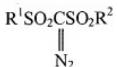
using said diazodisulfone with a light source of 300 nm or less at a reduced light exposure energy amount to generate an acid to create a positive tone pattern on a surface.

**Claim 19 (New):** The method of using the compound according to claim 18, wherein R<sup>1</sup> is a branched alkyl group having 3 to 8 carbon atoms; and R<sup>2</sup> is a branched alkyl group having 3 to 8 carbon atoms.

**Claim 20 (New):** The method of using the compound according to claim 18, wherein R<sup>1</sup> is a cyclic alkyl group having 3 to 8 carbon atoms; and R<sup>2</sup> is a cyclic alkyl group having 3 to 8 carbon atoms.

**Claim 21 (New):** The method of using the compound according to claim 18, wherein R<sup>1</sup> is a branched alkyl group having 3 to 8 carbon atoms; and R<sup>2</sup> is a cyclic alkyl group having 3 to 8 carbon atoms.

**Claim 22 (New):** A method of using a diazodisulfone compound of the formula:

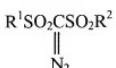


*(Handwritten mark: Great)*  
wherein R<sup>1</sup> is a cyclic alkyl group in which the alkyl group is hexyl; and R<sup>2</sup> is a cyclic alkyl group in which the alkyl group is hexyl, said method comprising:

using said diazodisulfone with a light source of 300 nm or less at reduced light exposure energy amount to generate an acid to create a positive tone pattern on a surface.

**Claim 23 (New):** The method of using the diazodisulfone of claim 22, wherein the reduced light exposure energy amount is a dose selected from the group consisting of 25mJ/cm<sup>2</sup> to 30mJ/cm<sup>2</sup>.

**Claim 24 (New):** A method of using a diazodisulfone compound of the formula:



wherein R<sup>1</sup> is a branched alkyl group in which the alkyl group is butyl; and R<sup>2</sup> is a branched alkyl group in which the alkyl group is butyl, said method comprising:

using said diazodisulfone with a light source of 300 nm or less at reduced light exposure energy amount to generate an acid to create a positive tone pattern on a surface.

U.S. Patent Reexam No. 90/004,812  
U.S. Patent: 5,216,135  
Reply to OA of **June 4, 2004**

**Claim 25 (New):** The method of using the diazodisulfone of claim 24, wherein the reduced light exposure energy amount is a dose selected from the group consisting of 25mJ/cm<sup>2</sup> to 30mJ/cm<sup>2</sup>.

**Claim 26 (New):** The method of using the diazodisulfone of claim 15, wherein the reduced light exposure energy amount is a dose selected from the group consisting of 25mJ/cm<sup>2</sup> to 30mJ/cm<sup>2</sup>.

**Claim 27 (New):** The method of using the diazodisulfone of claim 18, wherein the reduced light exposure energy amount is a dose selected from the group consisting of 25mJ/cm<sup>2</sup> to 30mJ/cm<sup>2</sup>.

U.S. Patent Reexam No. 90/004,812  
U.S. Patent: 5,216,135  
Reply to OA of **June 4, 2004**

**REMARKS**

Claims 7-11 and new claims 12-27 are pending in this application. Claim 7 has been allowed.

The new claims are supported in the patent and the priority document as follows:

Claim 12: (Patent: col.2, lines 9-12 and 25-26, col.13, line 34 and lines 50-68; Priority:

p.4, lines 1-5, p. 9, lines 1-5, p.14, lines 5-10, p.20, line 12);

Claim 13: (Patent: col.2, lines 25-26; Priority: p.4, lines 3-5);

Claim 14: (Patent: col.6, lines 25-35; Priority: p.16, lines 1-10);

Claim 15: (Patent: claim 1 and col.2, lines 9-12 and 25-26, col.13, line 34 and lines 50-68 Priority Doc.: p.4, lines 1-5, p. 9, lines 1-5, p.14, lines 5-10; p.18, lines 7-18; p.19, lines 1-11 and p.20, lines 4-12);

Claim 16: (Patent: claim 2; Priority Doc: p. 9, lines 1-5, and p.14, lines 5-10);

Claim 17: (Patent: claim 3; Priority Doc: p. 9, lines 1-5, and p.14, lines 5-10);

Claim 18: (Patent: claim 4 and col.2, lines 9-12 and 25-26, col.13, lines 50-68; Priority Doc.: p.4, lines 1-5, p. 9, lines 1-5, p.14, lines 5-10; p.18, lines 7-18; p.19, lines 1-11 and p.20, line12 to p.21, line 3);

Claim 19: (Patent: claim 5; Priority Doc: p. 9, lines 1-5, and p.14, lines 5-10);

Claim 20: (Patent: claim 6; Priority Doc: p. 9, lines 1-5, and p.14, lines 5-10);

Claim 21: (Patent: claim 7; Priority Doc: p. 9, lines 1-5, and p.14, lines 5-10);

Claim 22: (Patent: col.2, lines 9-48 and 25-26, col.13, lines 50-68; Priority Doc.: p.4, lines 1-5, p. 9, lines 1-5, p.14, lines 5-10; p.18, lines 7-18; and p.19, lines 1-11);

Claim 23: (Patent: col.13, lines 50-68; Priority Doc.: p.20, line 4 to p.21, line 3);

U.S. Patent Reexam No. 90/004,812  
U.S. Patent: 5,216,135  
Reply to OA of June 4, 2004

Claim 24: (Patent: col.2, lines 9-48 and 25-26, col.13, lines 50-68; Priority Doc.: p.4, lines 1-5, p. 9, lines 1-5, p.14, lines 5-10; p.18, lines 7-18; and p.19, lines 1-11);

Claim 25: (Patent: col.13, lines 50-68; Priority Doc.: p.20, line 4 to p.21, line 3);

Claim 26: (Patent: col.13, lines 50-68; Priority Doc.: p.20, line 4 to p.21, line 3); and

Claim 27: (Patent: col.13, lines 50-68; Priority Doc.: p.20, line 4 to p.21, line 3).

The Applicants respectfully submit that no new matter has been added.

**Claims 10 and 11 are objected to as being substantial duplicates of claims 8 and 9.**

Applicants respectfully request to defer canceling claims pending allowance of claims 8

and 9.

**Claims 8 and 9 are rejected under 35 USC 112, first paragraph, based on the written description requirement.**

Applicants respectfully urge that claims 8 and 9 are supported by the written description in the patent and the priority document as explained on p.4 and 5 of the response filed on February 4, 2004.

**Claims 8-11 are rejected under 35 USC 102(e) as being anticipated by Pawlowski et al. (USP 5,338,641) and claims 9 and 11 are rejected under 35 USC 103(a) as being obvious over Pawlowski et al. (USP 5,338,641).**

Applicants respectfully urge that claims 8-11 are not anticipated or rendered obvious by Pawlowski'641 as explained on p. 6-9 of the response filed on February 4, 2004.

**New Claims 12-13**

New claims 12-13 recite a reduced light exposure resist material which is used for a light source of 300nm or less.

A reduced light exposure resist material is novel, unobvious and supported in the many examples in the Applicants' patent and priority document.

Nowhere in the prior art is there disclosed using a reduced light exposure energy as in the Applicants' patent (col.7, lines 1-12):

As mentioned above, when pattern formation is carried out by using a chemical amplified resist material containing the compound of the formula (I), a large difference in solubility in the alkali developing solution takes place between the exposed portions and the non-exposed portions. As a result, there can be formed a positive tone pattern having good contrast. **Further, as is clear from the reaction scheme (5), since the acid generated by exposure to light acts catalytically, not only the necessary amount of acid can be produced by the exposure to light, but also the light exposure energy amount can be reduced.** (emphasis added)

Furthermore all the examples in the patent show a reduced energy exposure amount of either 25mJ/cm<sup>2</sup> or 30mJ/cm<sup>2</sup> as shown in all Examples 1-7 (see col.13, line 34 and Table 4, lines 54-65).

The stated Object of the Invention in the Applicants' priority document is as follows (p.8, lines 8-17):

The present invention was done under the circumstances stated above, and its objective is to provide a resist material comprising a resin which has high transmittance after exposure to i-line light and deep UV light such as KrF excimer laser light and has heat resistance and a photosensitive compound which effectively generates an acid with high sensitivity (**with low exposure energy**

**amount)** and has good stability in solution and in addition the acid generated from which has high transmittance. (emphasis added)

This stated Object of the Invention follows the Problems to be Solved by the Invention section of the priority document where the Applicants' explain that one problem with the prior art compounds is that "**it is difficult to obtain good pattern shape and in addition much exposure energy amount is required...**" (p.7, lines 19-21). On p.9, lines 16-18 the Applicants state: "**The resist material of the present invention is one which utilizes chemical amplification to decrease exposure energy amount as low as possible.**" The Applicants have made clear in the priority document that their invention is the use of **reduced or low** energy exposure amounts.

All Examples in the Applicants' priority document support the use of a reduced light exposure energy: Example 1: 18mJ/cm<sup>2</sup> ; Example 2: 15mJ/cm<sup>2</sup> ; Example 3: 23mJ/cm<sup>2</sup>; Example 4: 32mJ/cm<sup>2</sup> and Example 5: 15mJ/cm<sup>2</sup> (see Priority Doc. P. 18-21). This is because the **mechanism of the invention** as disclosed on p.16, lines 10-15 of the priority document, is exactly the same as **reaction scheme (5)** disclosed in the patent as explained above in col.6, lines 40-60.

In contrast, Pawlowski'641 discloses a light exposure energy of 78mJ/cm<sup>2</sup> in Example 7 (col.13) to 280mJ/cm<sup>2</sup> in Example 4 (col.12). The lowest light exposure energy dose, 78mJ/cm<sup>2</sup>, is more than two times the highest energy dose disclosed in either the Applicants' patent or priority document, namely Example 4: 32mJ/cm<sup>2</sup> in the Applicants' priority document. In addition 78mJ/cm<sup>2</sup>, is more than five times the lowest energy dose disclosed in either the

U.S. Patent Reexam No. 90/004,812  
U.S. Patent: 5,216,135  
Reply to OA of **June 4, 2004**

Applicants' patent or priority document, namely Examples 2 and 5: 15mJ/cm<sup>2</sup> in the Applicants' priority document.

Simply stated, the reduced light exposure resist material which is used for a light source of 300nm or less is both novel and unobvious and has been a part of the Applicants' invention since the filing of the priority document on January 30, 1990.

#### **New Claim 14**

The reaction scheme claimed in Claim 14, is novel, unobvious by virtue of being nowhere suggested or taught by the prior art. In addition it is clearly supported in the Applicants' patent in col.6, lines 20 to 35 and in the Applicants' priority document on p.16, lines 1-10.

#### **New Claims 15-21**

New claims 15-21 are method of use claims which would be considered as infringing the original patented claims, because the claims recite a method of using the patented product in a way consistent with the purpose of the invention and the disclosure in the specification.

The test for determining whether claims enlarge the scope of the claims of the original patent is if the new claims contain within its scope any conceivable apparatus or process which would not have infringed the original patent. *Hockerson-Halberstadt, Inc. v. Converse Inc.*, 183 F.3d 1369, 51 USPQ2d 1518 (Fed. Cir. 1999).

According to 35 USC § 271, direct infringement consists of making, using, offering to sell or selling any patented invention, without the authority of the patent owner. Using the

U.S. Patent Reexam No. 90/004,812

U.S. Patent: 5,216,135

Reply to OA of **June 4, 2004**

patent product, the product of claims 1-7 of the Applicants' patent, for its intended purpose, as recited in the disclosure and now claimed, would reasonably be considered direct infringement of the product claims 1-7. Therefore the scope of the method of use claims 15-21 does not enlarge the original patent scope, according to the Federal Circuit test stated above.

New claims 15-21 are nowhere disclosed or suggested in the prior art because of limitations regarding reduced light exposure energy amounts. As previously explained, Pawlowski '641 discloses a light exposure energy of  $78\text{mJ/cm}^2$  in Example 7 (col.13) to  $280\text{mJ/cm}^2$  in Example 4 (col.12). The lowest light exposure energy dose,  $78\text{mJ/cm}^2$ , is more than three times the lowest energy dose disclosed in the Applicants' patent,  $25\text{mJ/cm}^2$  and is more than two times the highest energy dose disclosed in the Applicants' patent  $30\text{mJ/cm}^2$ . It is clear that there could not possibly be any suggestion of a reduced light exposure energy amount. Therefore new claims are neither anticipated nor obvious over the prior art.

In light of the novelty and unobviousness of new claims 15-21, claims 15-21 are deemed allowable.

#### **New Claims 22 and 24**

These method of use claims are similar to pending claims 8 and 9. The support for the limitation of a "reduced light exposure energy" in both the patent and the priority document is explained above, as it applies to claims 12-13. This limitation is not disclosed or suggested anywhere in the prior art. The support for the claims has also been explained in the Response filed on February 4, 2004.

In light of the novelty and unobviousness of these claims, they are urged to be held allowable.

**New Claims 23, 25, 26 and 27**

These new claims, reciting reduced light exposure energy amounts of  $25\text{mJ/cm}^2$  or  $30\text{mJ/cm}^2$ , depend from claims 22, 24, 15 and 18 respectively.

As explained above, all the examples in the patent show a reduced energy exposure amount of either  $25\text{mJ/cm}^2$  or  $30\text{mJ/cm}^2$  as shown in all Examples 1-7 (see col.13, line 34 and Table 4, lines 54-65).

Also, all Examples in the Applicants' priority document also use a reduced light exposure energy amount: Example 1:  $18\text{mJ/cm}^2$  ; Example 2:  $15\text{mJ/cm}^2$  ; Example 3:  $23\text{mJ/cm}^2$ ; Example 4:  $32\text{mJ/cm}^2$  and Example 5:  $15\text{mJ/cm}^2$  (see Priority Doc. P. 18-21). This is because the mechanism of the invention as disclosed on p.16, lines 10-15 of the priority document, is exactly the same as reaction scheme (5) disclosed in the patent as explained above in col.6, lines 40-60.

Specifically, table 4, col. 13, lines 54-65, of the patent discloses three examples, Examples 3, 4 and 7, where an reduced light exposure energy amount of  $25\text{mJ/cm}^2$  is disclosed. In the Applicant's priority document, Example 3 on p. 20 discloses an exposure energy amount of  $23\text{mJ/cm}^2$ . While the exact amount of  $25\text{mJ/cm}^2$  is not written in *ipsis verbis* in the priority document, the disclosure including all of the examples in the priority document convey to those skilled in the art that the Applicants clearly invented the claimed diazodisulfone compound used at a light exposure energy amount of  $25\text{mJ/cm}^2$ .

This same conclusion was reached in the well settled case, *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 90). The applicants in *In re Wertheim* relied on their Swiss priority applications which did not contain an express written description of the solid content limitations of a concentrated extract prior to foaming, i.e.) "at least 35%" (Claim 1) and "between 35% and 60%" (Claims 2, 4, 37 and 38). *Id.* at 262, 191 USPQ at 96. The relevant passage in the Swiss applications disclosed that a coffee extract is concentrated prior to foaming by suitable means "until a concentration of 25-60% solid matter is reached." The examples in the priority application disclosed specific embodiments having solid contents of 36% and 50%. *Id.* at 262, 191 USPQ at 96.

While the precise claimed ranges were not exactly disclosed in the priority documents, the court stated the following:

Mere comparison of ranges is not enough, nor are mechanical rules a substitute for an analysis of each case on its facts to determine whether an application conveys to those skilled in the art the information that the applicant invented the subject matter of the claims. *In re Wertheim*, 541 F.2d at 263, 191 USPQ at 97.

While the court found that the priority documents did not support a claim limitation of "at least 35%," the court did find support for the narrower range limitation of between "35 and 60%." The court concluded:

In the context of this invention, in light of the description of the invention as employing solids contents within the range of 25-60% along with specific embodiments of 36% and 50%, we are of the opinion that, as a factual matter, persons skilled in the art would consider processes employing a 35-60% solids content range to be part of appellants' invention and would be led by the Swiss disclosure so to conclude. Cf. *In re Ruschig supra*. The PTO has done nothing more than to argue lack of literal support, which is not enough. If lack of literal support alone were enough to support a rejection under § 112, then the statement of *In re Lukach, supra*, 58 CCPA at 1235, 442 F.2d at 969, 169 USPQ at 796, that "the invention claimed does not have to be described in *ipsis verbis*

U.S. Patent Reexam No. 90/004,812  
U.S. Patent: 5,216,135  
Reply to OA of June 4, 2004

in order to satisfy the description requirement of § 112," is empty verbiage. *Id.* at 265, 191 USPQ at 98. (emphasis added)

The facts of *Wertheim* are almost the same in this case. In the priority document there is a disclosure of five examples with energy does from 18mJ/cm<sup>2</sup> to 32mJ/cm<sup>2</sup>. Example 1: 18mJ/cm<sup>2</sup>; Example 2: 15mJ/cm<sup>2</sup>; Example 3: 23mJ/cm<sup>2</sup>; Example 4: 32mJ/cm<sup>2</sup> and Example 5: 15mJ/cm<sup>2</sup> (see Priority Doc. P. 18-21). The disclosure which includes Example 3 at 23mJ/cm<sup>2</sup>, would convey to the skilled artisan that using the reduced exposure energy of 25mJ/cm<sup>2</sup> was a part of the Applicants' invention because of the obvious stated purpose of the invention and because 25mJ/cm<sup>2</sup> is a light exposure energy amount equivalent to the 23mJ/cm<sup>2</sup> used in Example 3. Moreover, 25mJ/cm<sup>2</sup> is the midpoint light exposure energy amount between the range of 18mJ/cm<sup>2</sup> and 32mJ/cm<sup>2</sup> disclosed in the Examples.

Following the reasoning of *Wertheim*, 30mJ/cm<sup>2</sup> of Examples 2, 5 and 6 of the patent, is conveyed by the priority document as part of the Applicants' invention because the reduced light energy exposure amounts of Examples 1-5 of the priority document, as a factual matter, convey to the skilled artisan that using 30mJ/cm<sup>2</sup> is a feasible amount well within the scope of the Examples 1-5. The amount of 30mJ/cm<sup>2</sup> it is an equivalent light exposure energy amount of that of Example 4: 32mJ/cm<sup>2</sup> (p.20-21) of the priority document.

Such reduced light energy exposure amounts are not anticipated or taught by the prior art. These method of use claims are both novel and unobvious and are therefore deemed allowable.

Based on the showing above, it is respectfully requested that all claims be allowed.

U.S. Patent Reexam No. 90/004,812

U.S. Patent: 5,216,135

Reply to OA of June 4, 2004

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact the Applicants' undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

ARMSTRONG, KRATZ, QUINTON, HANSON & BROOKS, LLP

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